FAT BOY SERIES™

KD-MSW4x2

4 Inputs to 2 Outputs HDTV Matrix Switcher

Operating Instructions

The Fat Boy Series KD-MSW4x2 by Key Digital™, is an analog HDTV 4-Input to 2-Output matrix switcher and distribution amplifier. For each of the two displays connected to its output, any of up to four source inputs can be separately and seamlessly switched with the professional Fade-to-Black and Video Muting features. It supports both component video (YPbPr) and RGBHV video formats; and S-Video and composite video (CVBS), with adapters. Concurrent with the video, it switches and distributes PCM coax digital audio, and analog stereo audio (no analog audio for RGBHV video). With analog video bandwidths up to 300 MHz, the KD-MSW4x2 handles all HD and SD resolutions (50 and 60 Hz) including 1080p/60, with no degradation in signal quality. It is simple to operate and control via front panel pushbuttons with LEDs to monitor the selections, IR remote control, IR Extender, wired IR, and is compatible via RS-232 with all control systems.

HDTV CERTIFIED 480p · 720p · 1080i · 1080p

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Rev 0 – July 2006

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Quick Setup Guide

If the user or installer is familiar with Video/Audio Matrix Switching and Distribution, then the following Quick Setup Guide can be used as a shortcut. *It is recommended to always follow all the detailed instructions provided in this entire Operating Manual to properly hook-up, operate, and control the KD-MSW4x2 product.*

Basics Facts About the KD-MSW4x2

The KD-MSW4x2 is a 4-Input to 2-Output video and audio matrix switcher and distribution amplifier. Each of its two distinct outputs can be used to drive two separate displays and audio/surround sound systems. One of up to four source input devices can be independently and separately selected to drive each of the two displays and audio systems. The product provides professional-grade switching, with the Fade-to-Black and Video Mute features, preventing image glitches when switching between sources.

Typical source input devices that can be matrix switched with the KD-MSW4x2 include:

- DVD players and changers
- Cable TV, satellite, and terrestrial Set Top Boxes (STBs)
- Digital Video Recorders (DVRs)
- D-VHS, S-VHS and VHS VCR's
- Electronic game boxes
- Personal Computers (PCs)

The KD-MSW4x2 handles all HD and SD resolutions, and is compatible with all standard analog video signal formats, including:

- 1080p, 1080i, 720p, 576p, 576i, 540p, 480p, 480i
- 50 Hz or 60 Hz refresh rates

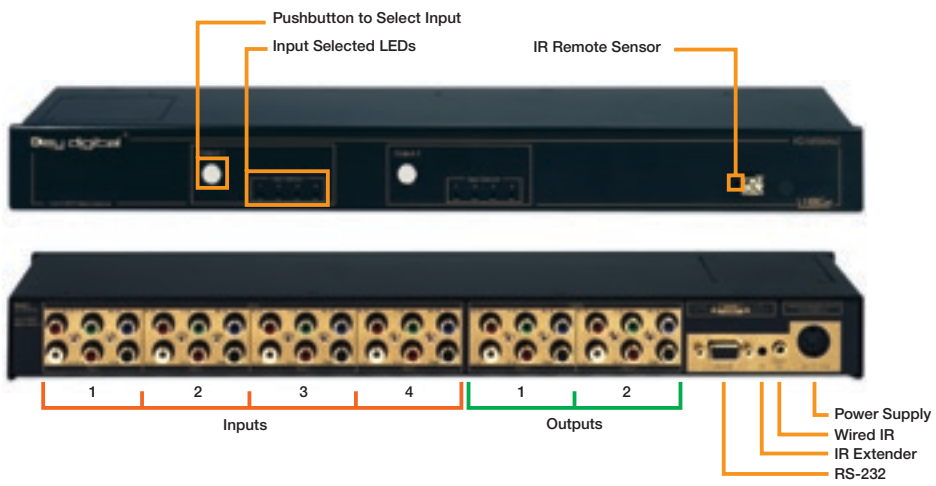
The KD-MSW4x2 performs no video or audio processing, and supports video bandwidths up to 300 MHz. Its output stage drives high-quality, equal-length video cables up to 300' or more. The output formats and resolutions are identical to those at the input to the unit.

The KD-MSW4x2 uses RCA jacks for video and audio inputs and outputs, and supports both component video (YPbPr) and RGBHV video formats; as well as S-Video and composite video (CVBS), with adapters. Along with the video, it concurrently switches and distributes PCM coax digital audio, and analog stereo audio (for YPbPr operation only).

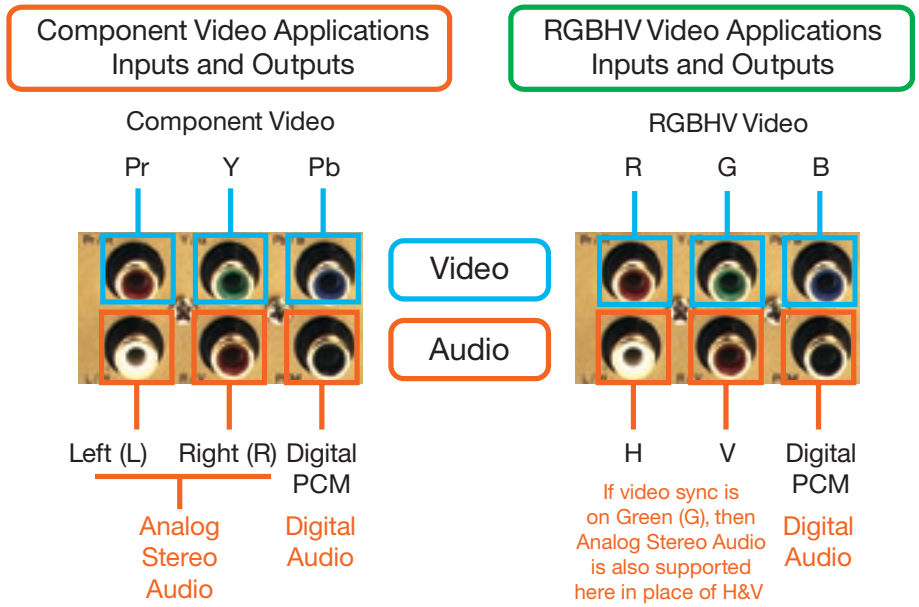
The KD-MSW4x2 has four (4) Input Ports and two (2) Output Ports. Each Input Port and Output Port is comprised of six (6) color-coded RCA jacks:

- 3 analog video connectors (YPbPr or RGB, shared as Pr/R Y/G Pb/B)
- 2 analog audio connectors (Left and Right stereo pairs)
- The analog audio input/output connectors also serve as the horizontal (H) and vertical (V) sync for RGBHV signals
- 1 PCM digital coax audio connector

Front and Rear Panels



Typical Input/Output Port



Quick Installation

CAUTION: Do not connect the external supply (provided) to the back of the KD-MSW4x2 unit until ALL of your video and audio connections are completed.

For proper operation of the high quality electrical circuits in the KD-MSW4x2 unit, do NOT "daisy chain" inputs:

- **Each input of the KD-MSW4x2 has its own 75 Ω termination**
- **Do NOT feel a source to multiple KD-MSW4x2 inputs without proper distribution equipment**

- **Connect up to four source devices to the Input Ports 1 - 4 on the rear panel of the KD-MSW4x2 unit.**
- **Connect two displays to the Output Ports 1 and 2 on the rear panel of the KD-MSW4x2 unit.**

Input/Output Ports and Formats

- The output format = the format of the selected input source
- Each Port supports:
  - YPbPr component video, analog stereo left and right audio, and digital PCM audio
  - RGBHV video and digital PCM audio
  - RGB video with sync on the green channel, analog stereo left and right audio, and digital PCM audio
  - S-Video and composite video (CVBS), with adapters
- Each connector can accommodate various signals, on a shared basis:
  - Red Connector: Pr/R
    - Pr label is for component video
    - R label is for the red channel for RGBHV video
  - Green Connector: Y/G
    - Y label is for component video
    - G label is for the green channel for RGBHV video
  - Blue Connector: Pb/B
    - Pb label is for component video
    - B label is for the blue channel for RGBHV video
  - White Connector: L/H
    - L label is for the left analog stereo audio channel
    - H label is for the horizontal sync for RGBHV video
  - Red Connector: R/V (Right analog stereo audio, or vertical sync for RGBHV video)
    - R label is for the right analog stereo audio channel

» V label is for the vertical sync for RGBHV video

➔ Black Connector: PCM

» For PCM digital coax audio

Control Connections

› Decide how the KD-MSW4x2 will be controlled

› If using an IR (Infrared) Extender, the wired IR, or an external Control System (via the RS-232 port on the KD-MSW4x2), make the appropriate connections

Power

› Use ONLY the external power supply provided with the KD-MSW4x2 unit. Use of any other power supply VOIDS the Key Digital™ Warranty and may potentially damage the unit and any associated equipment.

› Connect the external power supply provided with the KD-MSW4x2 to the jack on the rear panel of the unit.

› Connect the power supply to an appropriate source of power, such as from a wall outlet.

Operation

› Follow all manufacturer instructions for the safe and proper operation of the source and display products that have been connected to the KD-MSW4x2.

› Using one of the convenient control options for the KD-MSW4x2, separately select source input 1, 2, 3, or 4 for output display 1, and source input 1, 2, 3, or 4 for output display 2.

› Use the IR remote control with an extensive command and control capability. See the description for the IR remote control provided later in this Operating Manual.

› It is also possible under RS-232 control to allow any one of the four inputs to be switched and distributed to both outputs [see the RS-232 Command List].

Input 1, 2, 3, and 4 LED indicators

Use this front-panel pushbutton to select any of the up to four source input devices to drive the display and audio system wired to Output 1. Press the button and cycle through Input 1, 2, 3, and 4.

Repeat for Output 2 using the appropriate Output 2 pushbutton and LEDs for monitoring the input selection.

Note: Since the KD-MSW4x2 Matrix Switcher does NOT perform video processing, the output video format is the same as the input video format. This means that the video resolution is not changed and also that form of video is input to the unit, for example Component Video, the output will be in exactly the same format.

Additional Product Features

Several new features have been added to this generation of Key Digital™ switchers, called "Fade-to-Black" and "Video Mute." Both of these features let the user switch like a pro, like in a live studio.

Fade-to-Black

The Fade-to-Black feature allows for switching between input/output combinations without the usual visual signal noise, glitches, and sync roll that traditionally accompany switching between video signals. The feature momentarily forces the video image to black as the desired source input is selected for the chosen output. ***This feature is applied automatically and the fade time interval is programmable via RS-232.***

Video and Audio Mute

Video and Audio Mute enables the user to mute the audio and video signal (the display goes to black) at the chosen output, using the RS-232 [see the RS-232 Command List] or IR remote control. Using the IR remote control for Video and Audio Muting:

Activate Video & Audio Mute: R1 → output (1~2) → up arrow

Deactivate Video & Audio Mute: R1 → output (1~2) → down arrow

Introduction

Thank you for purchasing the KD-MSW4x2 by Key Digital™, a state-of-the-art analog HDTV Fat Boy Series 4-Input to 2-Output matrix switcher and distribution amplifier.

Each of its two distinct outputs can be used to drive two separate displays (and audio / surround sound systems), even the most exotic high-end HDTV projectors on the market. One of up to four source input devices (like DVD players, Set Top Boxes, etc.) can be independently and separately selected to drive each display. Switch like a pro in the Studio, with the all-new "Fade-to-Black" and "Video Muting" features that eliminate video "glitches" on the display when switching different inputs. If desired, the unit functions as a distribution amplifier, simultaneously routing any single input to both outputs. Also, the product is expandable.

HDTV CERTIFIED
480p · 720p · 1080i · 1080p

The KD-MSW4x2 is perfectly suited for studio, home theater, custom installation, retail, and in fact any and all analog HD and SD applications. With analog video bandwidths up to 300 MHz, it handles all HD and SD resolutions (50 and 60 Hz) including 1080p/60, with no degradation in video or audio signal quality. Since the KD-MSW4x2 performs no video or audio processing, the video and audio signals remain pure and untouched, and hence the quality of the output signals is the same as the quality of the input signals.

Typical source input devices that can be matrix switched with the KD-MSW4x2 include:

- DVD players
- Cable TV, satellite, and terrestrial Set Top Boxes (STBs)
- Digital Video Recorders (DVRs)
- D-VHS, S-VHS and VHS VCR's
- Electronic game boxes
- Personal Computers (PCs)

The KD-MSW4x2 uses RCA jacks for video and audio inputs and outputs, and supports both component video (YPbPr) and RGBHV video formats. Along with the video, it concurrently switches and distributes digital PCM, and analog stereo audio for YPbPr operation only.

The KD-MSW4x2 is simple to operate and control via front panel pushbuttons and LEDs, IR (Infrared) remote control, IR Extender, wired IR, and is compatible via RS-232 with all control systems.

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The KD-MSW4x2 boasts a 300 MHz analog video bandwidth due in part to the following custom and proprietary Key Digital™ technologies engineered into the product to ensure the highest standard of picture quality:

Key Digital™ Exclusive Technologies

LHBC™ LINEAR HIGH BANDWIDTH CIRCUIT · iAS™ INTELLIGENT AUTO SENSE · MULTI-LAYER™ BOARD TECHNOLOGY · SURFACE MOUNT™ TECHNOLOGY

Terminology

A/V	Audio/Video	Used in reference to the audio and video signals typically associated with a source device or display
B	Blue	The "blue" video channel
DVR	Digital Video Recorder	For example, a TiVo box
G	Green	The green video channel
H	Horizontal	Horizontal video synchronizing signal
IR	Infrared	IR, like the Infrared remote control. Simply point the front of an IR remote control unit towards the IR sensor on the product to be controlled.
L	Left	The Left channel of an analog stereo pair, Left and Right
LED		LEDs (light-emitting diodes) are like small light bulbs that light up to indicate a selection, and are used as status indicators.
ms	Milliseconds	Unit of time, in seconds/100; for example, the factory default for Fade-to-Black video muting is 240 ms, which is equal to 240 x 10-3 (0.24) seconds
PCM, digital PCM	Pulse Code Modulation	PCM is a sampling technique for digitizing analog signals, especially audio signals. Used in this Operating Manual to refer to digital audio.
R	Right	Audio: The Right channel of an analog stereo pair, Left and Right
	Red	Video: The "red" video channel
RCA jack		An RCA jack or what was called a “phono plug” is an industry standard audio connector used for the audio inputs and outputs of the KD-MSW4x2. The black connector jack [“PCM”] is used for the digital audio formats. Analog stereo audio uses both jacks, where white = the left channel [“L”], and red = the right channel [“R”]. The video inputs and outputs also use RCA connectors.
RGBHV	"VGA"-like video	Video signal wiring format using red (R), green (G), and blue (B) signals. The horizontal (H) and vertical (V) signals are used for video synchronization. Sometimes the sync signals are embedded in the green (G) channel, which frees-up the H&V connectors.
STB	Set Top Box	For example, a Cable STB or Satellite STB
V	Vertical	Vertical video synchronizing signal
VAC	Volts, AC	Specifies the AC line voltage, such as nominally 120 volts in the US
YPbPr	Component Video	Video signal wiring format using “luminance” (Y) and two color signals (Pb and Pr). Typically the horizontal and vertical video synchronizing signals are embedded in the Y channel.

Matrix Switching

The KD-MSW4x2 is a Matrix Switcher that accepts up to four inputs from source devices, and can drive up to two displays.

A “Matrix Switcher” allows the user to select any input source device, and have it available on any desired output (typically a display). For example, the user may choose to view a DVD player on the display that is connected to Output 1, and view the satellite box on the display that is connected to Output 2. A true matrix switcher, the KD-MSW4x2 provides the user with two degrees of freedom:

- The ability to select any particular input source device, namely the source devices connected to Input 1, 2, 3, or 4
- These input devices can be chosen separately for Output 1 and Output 2

A "4x2" Matrix Switching Example:
Select Video Source #3 to Display 1
Select Source #1 to Display 2

Video Source	Display 1	Display 2
1 - Satellite STB	→	→
2 - DVR		
3 - DVD Player	→	
4 - Cable STB		

Distribution Amplifier Application

If desired, the unit also acts as a distribution amplifier, simultaneously routing any single input to both outputs.

Using a Matrix Switcher as a Distribution Amplifier Example:
Select Video Source #4 to Display 1
Select Video Source #4 to Display 2

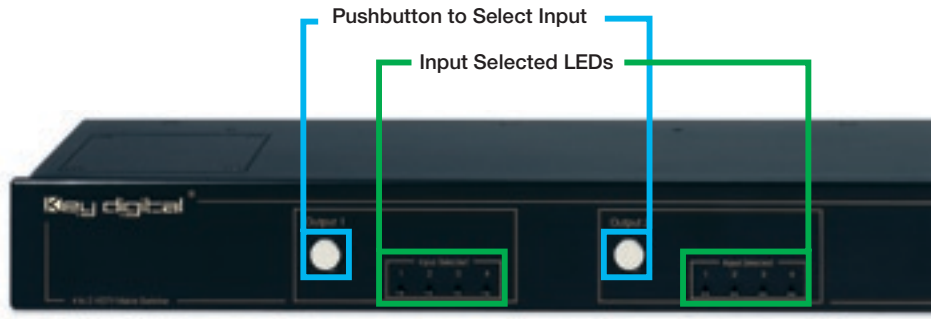
Video Source	Display 1	Display 2
1 - Satellite STB		
2 - DVR		
3 - DVD Player		
4 - Cable STB	→	
	→	→

Convenient front-panel LED indicatiors display the selecte input, for each of the two outputs

The KD-MSW4x2 allows the matrix-switched input/output combinations to be configured via the front panel pushbuttons, with the user's input selection displayed by front-panel LED indicators for each of the two outputs. Switching can be accomplished conveniently in any of three ways:

- Manually, using the front panel pushbuttons that cycle through the four inputs
- Remotely, using the supplied IR remote control
  - A rear-panel IR Extender is also provided
  - A rear-panel wired IR is also provided
- Using the RS-232 control, the unit is compatible with all Control Systems

Regardless of how the unit is controlled, the user's input selection is confirmed on the front-panel LED indicators for each of the two outputs.



What's Included

The following contents are provided in the carton:

1. One KD-MSW4x2 unit
2. Separate external 6-Volt power supply
3. IR remote control with batteries included
4. Operating Manual (Instructions)
5. Warranty card

CAUTION: When installing the KD-MSW4x2 unit, make all video and audio hookups and connections before plugging in the external power supply (provided). Do NOT apply power to the unit until all video and audio connections have been made to the KD-MSW4x2 unit from the "source" devices and to the output displays and/or audio systems.

Use only the external power supply provided with the KD-MSW4x2 unit or you VOID the Key Digital™ Warranty and may potentially damage to the unit and associated equipment.

The KD-MSW4x2 Operating Manual

The successful system integration and operation of the KD-MSW4x2 4-to-2 HDTV Matrix Switcher is very important to us at Key Digital™. Please follow all of the instructions provided here to ensure proper operation of the product. Contact Key Digital™ immediately if any difficulties are incurred (see the end of this Operating Manual for contact information).

Quick Facts about the KD-MSW4x2

The KD-MSW4x2 by Key Digital, is an analog HDTV Fat Boy Series 4-Input to 2-Output matrix switcher and distribution amplifier. It is perfectly suited for studio, home theater, custom installation, retail, and in fact any and all analog HD and SD applications.

Typical Configuration: Analog HDTV

- Connect four sources to the input of the KD-MSW4x2 (for example: a DVD player, Cable Set Top Box, Satellite Set Top Box, and PC)
- Connect two displays to the output of the KD-MSW4x2 (for example, a Plasma and an LCD display)
- Connect the audio outputs of the KD-MSW4x2 to surround sound or other audio systems, or to the speakers in the displays
- It is expandable

Matrix Switcher and Distribution Amplifier

- For each of the two KD-MSW4x2 outputs that can be used to drive separate displays, one of the four source inputs can be independently selected
- For example, it's as easy as 1, 2, 3:

1. Connect the video and audio from a DVD player, Cable Set Top Box, Satellite Set Top Box, and PC to the inputs of the KD-MSW4x2
2. Connect the video (and audio) outputs of the KD-MSW4x2 to two displays, a Plasma and an LCD (the audio may be separately connected to surround sound or other audio systems, or to the speakers in the displays)
3. Use any of the control options on the KD-MSW4x2 to select the Cable Box to drive the Plasma and the DVD player to drive the LCD, or any other combination

- It is also possible under RS-232 control to allow any one of the four inputs to be switched and distributed to both outputs.

Professional Switching Features

- **Fade-to-Black:** allows for switching between input/output combinations without the usual visual signal noise, glitches, and sync roll that traditionally accompany switching between video signals
  - → The feature momentarily forces the video image to black as the desired source input is selected for the chosen output
  - → This feature is applied automatically
  - → Fade time interval is programmable via the RS-232 [see the RS-232 Command List], and is equivalent to a "Video Mute" to force the video to black during switching

- **Video Mute:** enables the user to mute the video signal (the display goes to black) at the chosen output

Formats

- Video:
  - → Supports component video (YPbPr) and RGBHV video formats
  - → Supports S-Video and composite video (CVBS), with adapters
  - → Output stage drives high-quality, equal-length video cables up to 300' or more
- Audio:
  - → Along with the video, the KD-MSW4x2 switches and distributes digital PCM, and analog stereo audio:
- Digital PCM is available with either YPbPr or RGBHV video
- Analog stereo audio is available with YPbPr video but not RGBHV video, unless the sync is on green (G) channel
- Uses RCA jacks for video and audio inputs and outputs

Resolution

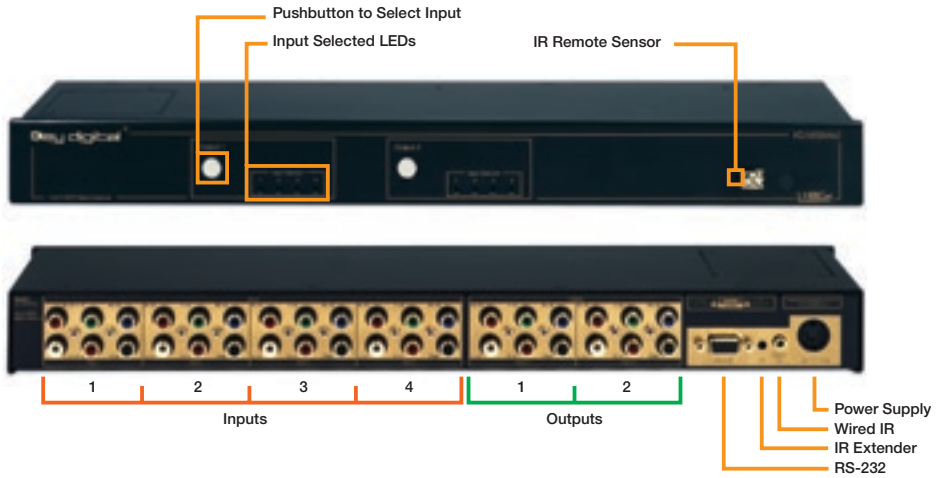
- Handles all HD and SD resolutions (50 and 60 Hz) including 1080p/60
- Supports analog video bandwidths up to 300 MHz
- The KD-MSW4x2 performs no video or audio processing:
  - → The video and audio signals remain pure and untouched
  - → Introduces no degradation in video or audio signal quality

Control

- Simple to operate, control, and monitor via:
  - → Front panel pushbuttons and LEDs
  - → IR remote control, with extensive commands and control
  - → IR Extender
  - → Wired IR
  - → All control systems (with RS-232)

Examine the Front and Rear Panels

Become familiar with the front and rear panels of the KD-MSW4x2 unit.



Front Panel

The front panel contains the pushbutton selection switches and associated input select LED indicators for Output 1 and Output 2:

- For each output, select source Input 1, 2, 3, or 4

The IR remote control sensor is also located on the front panel:

- A clear line-of-site to the sensor is required when operating the IR remote control provided with the unit

Rear Panel

The rear panel contains 4 Input Ports and 2 Output Ports:

- Each Port is comprised of 6 color-coded RCA connectors
- Each Port can support:
  - YPbPr component video, analog stereo left and right audio, and digital PCM audio
  - RGBHV video and digital PCM audio
  - RGB video with sync on the green channel, analog stereo left and right audio, and digital PCM audio

- Each connector can accommodate various signals, on a shared basis:
  - Red Connector: Pr/R
    - Pr label is for component video
    - R label is for the red channel for RGBHV video
  - Green Connector: Y/G
    - Y label is for component video
    - G label is for the green channel for RGBHV video
  - Blue Connector: Pb/B
    - Pb label is for component video
    - B label is for the blue channel for RGBHV video
  - White Connector: L/H
    - L label is for the left analog stereo audio channel
    - H label is for the horizontal sync for RGBHV video
  - Red Connector: R/V (Right analog stereo audio, or vertical sync for RGBHV video)
    - R label is for the right analog stereo audio channel
    - V label is for the vertical sync for RGBHV video
  - Black Connector: PCM
    - For PCM digital coax audio
- The following connectors are also provided on the rear panel:
  - RS-232 Connector
  - IR Extender sensor
  - Wired IR serial port
  - External power supply connector

Connecting the Video and Audio Inputs and Outputs

Decide on a safe location to place or mount the KD-MSW4x2. Provide enough space for sufficient airflow and ventilation, especially if the unit is left "On" most of the time.

Do not connect the external supply (provided) to the back of the KD-MSW4x2 unit until ALL of your video and audio connections are completed.

Test for proper operation of the unit, interconnections, and cables before final installation of cables behind walls or ceilings. The output stage of the KD-MSW4x2 is capable of driving high-quality, equal-length video cables up to 300' or more.

Connecting A/V Equipment

Connecting A/V equipment to the KD-MSW4x2 HDTV Matrix Switcher is straightforward and easily accomplished via the ergonomic rear panel connector array. Because not all consumer equipment marketed today uses RCA connector interfaces, it may be necessary to employ adapter plugs and/or cable assemblies to interface these various devices to the unit.

The video signal format must be considered when making connections to the KD-MSW4x2 unit. Simply match the A/V device's output (namely YPbPr "Component" or RGBHV "VGA" video) to a similar video signal output configuration on the KD-MSW4x2. S-Video and/or composite video may also be interfaced with the unit, using appropriate adapters available separately.

The same consideration applies to the audio interfaces. Both analog and digital audio output options are provided on the KD-MSW4x2. Use the appropriate format, such as analog audio when connecting directly to the audio inputs of a video monitor; or digital audio, when connecting instead to an A/V receiver having coaxial digital (PCM) interfaces for decoding surround sound signals.

CAUTION: The output stage of the KD-MSW4x2 can drive high-quality length video cables up to 300' or more. Be sure to use high-quality cables like those available through Key Digital™. Always ensure cables for each output are equal in length for each video component.

CAUTION: For proper operation of the high quality electrical circuits in the KD-MSW4x2 unit, do NOT "daisy chain" inputs:

- **Each input of the KD-MSW4x2 has its own 75 Ω termination**
- **Do NOT feel a source to multiple KD-MSW4x2 inputs without proper distribution equipment**

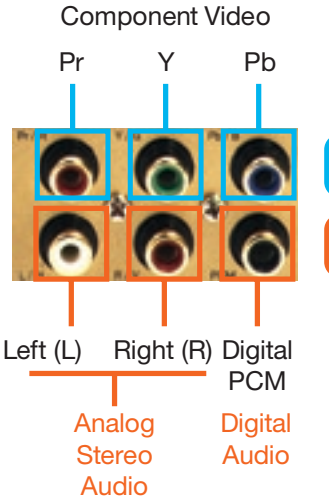
CAUTION: Connecting digital PCM audio signals directly to the analog audio input of a TV monitor, display, or other device can result in severe damage to its speakers.

The 4 Input Ports and the 2 Output Ports are Configured Identically

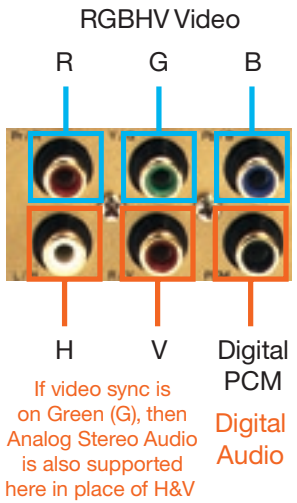
The Port configurations are the same for the 4 Input Ports and the 2 Output Ports. Each Port is comprised of six (6) color-coded RCA connectors:

- Connect up to four video and audio sources to the RCA jack Input Ports of the KD-MSW4x2.
  - Digital PCM audio is available with either YPbPr or RGBHV video
  - Analog stereo audio is available with YPbPr video but not RGBHV video, unless the sync is on green (G)
- Connect up to two displays to the RCA jack Output Ports of the KD-MSW4x2. The audio outputs from the product can be connected to the audio inputs of the display, or separate surround sound or other audio systems.

Component Video Applications Inputs and Outputs



RGBHV Video Applications Inputs and Outputs

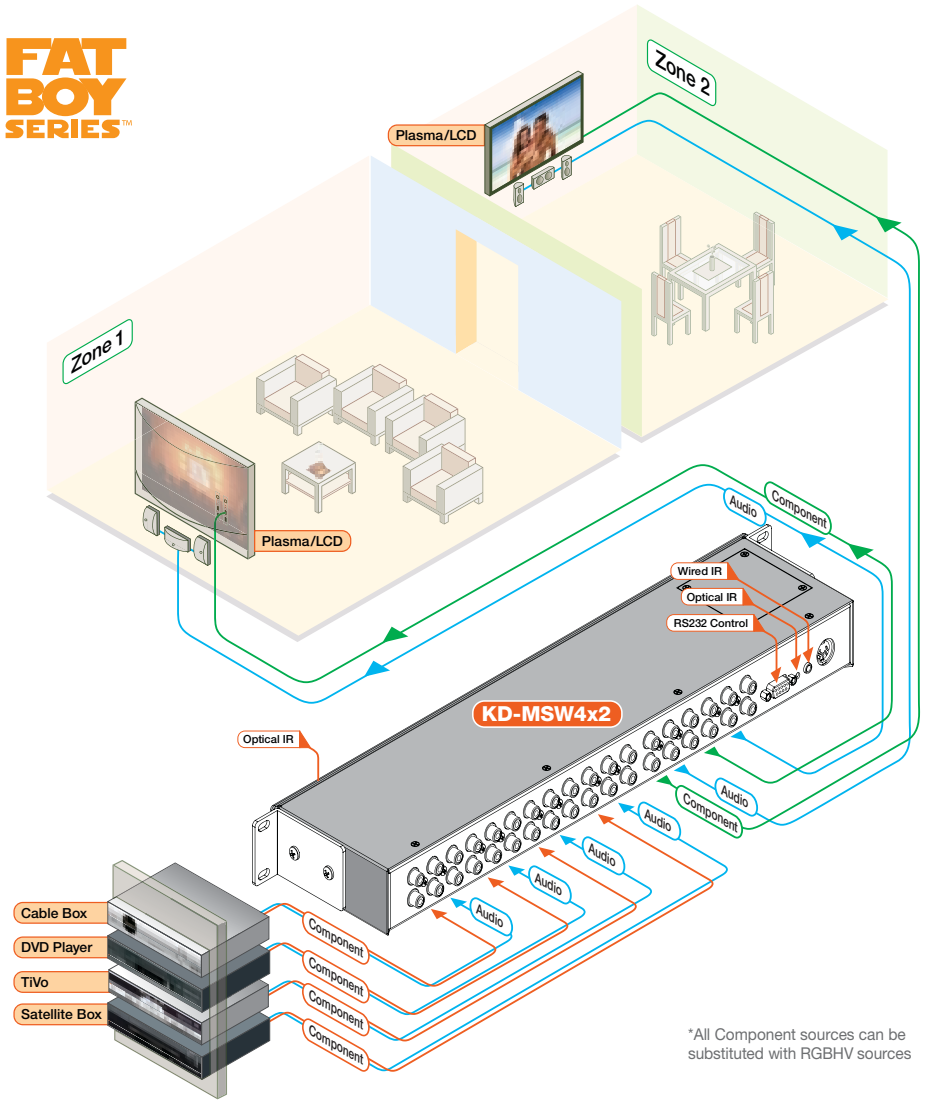


Video

Audio

Note: The left and right analog stereo audio interfaces also double as the horizontal and vertical sync signals (respectively) for the RGB video interface.

Typical Application Example for the KD-MSW4x2 HDTV Matrix Switcher



HDTV CERTIFIED 480p · 720p · 1080i · 1080p

Key Digital® Exclusive Technologies: LHBC™ · iAS™ Intelligent Auto Sense · MULTI-LAYER™ Board Technology · SURFACE MOUNT™ Technology

Supported Technologies: AMX · CRESTRON · Control4 · RS-232 · xantech®

Detailed Input/Output Descriptions

The interconnection of video and audio equipment in the various formats supported by the KD-MSW4x2 unit is described here in detail. This section is particularly useful if some source devices or displays are only available with S-Video or Component Video formats

For proper operation of the high quality electrical circuits in the KD-MSW4x2 unit, do NOT "daisy chain" inputs:

- ➔ **Each input of the KD-MSW4x2 has its own 75 Ω termination**
- ➔ **Do NOT feed a source to multiple KD-MSW4x2 inputs without proper distribution equipment**

High-quality Component Video (YPbPr) and "VGA" (RGBHV) Source Equipment

Some source equipment may have an analog video output that is called Component Video, a 3-wire video format with the video signals labeled YPbPr. Another common analog video output format is RGB (like the "VGA" outputs on a computer), which typically has separate H&V sync signals. The KD-MSW4x2 HDTV Matrix Switcher is the perfect choice for switching Component Video and RGBHV Video source devices to displays with analog inputs.

Example: Connecting a digital TV set-top receiver with Component Video three-wire YPbPr or "VGA" five-wire RGBHV video Outputs to the KD-MSW4x2 HDTV Matrix Switcher Inputs

YPbPr Component Video

Connect the three-wire green, blue and red YPbPr cables from the set-top receiver of choice, to the green, blue, and red color-coded connectors of any one of the four Input Ports on the rear of the KD-MSW4x2 unit. Connect the white and red analog stereo audio cables from the set-top receiver to the white and red connectors of the same Input Port of the KD-MSW4x2 unit. If a digital audio coaxial output is available on the set-top receiver, it can then connect to the black-coded PCM connector on the KD-MSW4x2 unit.

Connect the green, blue, and red connectors from Output Ports 1 or 2 on the KD-MSW4x2 unit to the corresponding component video jacks on the desired display. Connect the white and red analog audio jacks from the same Output Port to the corresponding white and red audio jacks on the audio system (which may be built into the display). If digital PCM audio is desired from the set-top receiver, connect a cable from the black connector in the same chosen Output Port to the A/V receiver's coaxial digital audio input.

CAUTION: To prevent damage to equipment, do NOT connect the KD-MSW4x2 digital PCM audio outputs to any analog audio inputs on a display or audio system!

RGBHV

If the set-top receiver of choice employs RGBHV outputs, a 15-pin "breakout" adapter cable may needed to implement the interface. In this instance connect the red, green and blue connectors from this adapter cable to the red, green and blue connectors, again on any one of the four Input Ports of the KD-MSW4x2 unit. Connect the black and yellow wires from the breakout cable to the white (H) and red (V) connectors of the same Input Port of the KD-MSW4x2 unit.

Connect the RGBHV video signals from Output Ports 1 or 2 on the KD-MSW4x2 unit to the corresponding RGBHV video jacks on the desired display. A second 15-pin breakout cable may be required for certain sets.

It is not possible to use analog audio switching when in RGB video applications because the H&V sync signals required for the RGB format occupy the port connectors typically used for the audio signals. Digital PCM may be used for this application, as described above.

This same connection procedure described above applies to any other peripheral device that one may wish to interface with a desired display medium, including DVD players and game consoles.

Lower-quality S-Video (two-wire) or Composite Video (CVBS) Source Equipment

S-Video

For S-Video applications, a "breakout" adapter cable is required to connect a source device to the KD-MSW4x2 unit. This cable is equipped with an S-Video (DIN) plug at one end and a pair of RCA plugs at the other connected to white and yellow conductors. Connect the white (Y) conductor to the green RCA connector of the selected Input Port, and connect the yellow (C) conductor to either the blue or red RCA connector in the same input field. Connect the white and red analog stereo audio connectors of the source device to the white and red connectors in the same Input Port of the KD-MSW4x2 unit.

Connect the green RCA connector from Output Ports 1 or 2 on the KD-MSW4x2 unit to the white (Y) conductor of a second S-video adapter cable. Connect the blue or red connector to the yellow (C) conductor. Plug the other end of the adapter cable into the TV or monitor's S-video input. Connect the white and red analog stereo audio cable connectors to the white and red connectors of the same Output Port on the KD-MSW4x2 unit. Connect the other end of the audio cable pair to the white and red analog audio input of the display.

Composite Video (CVBS) Connection

Connect the Composite Video connector (yellow) from a VCR or other source device to the green RCA connector in the selected Input Port on the KD-MSW4x2 unit. Connect another composite video cable from the green RCA connector from Output Ports 1 or 2 on the KD-MSW4x2 unit to the TV or video monitor. Follow the instructions above for connecting analog audio.

Control Connections

Decide how the KD-MSW4x2 will be controlled. If using an IR (Infrared) Extender, the wired IR, or an external Control System (via the RS-232 port on the KD-MSW4x2), make the appropriate connections now.

RS-232

The KD-MSW4x2 HDTV Matrix Switcher is compatible with all Control Systems. Use the D-sub 9-pin connecter on the rear panel and an appropriate cable to attach the unit to an external Control System. An RS-232 cable is not supplied* with the base KD-MSW4x2 unit. Carefully insert your own RS-232 cable (9-pin) to the back of the unit, and to an appropriate PC or Control System.

If applicable, Key Digital™, Fat Boy KD-MSW4x2 expansion units come preconfigured from the factory with their own RS-232 cable

IR Extender

A rear-panel IR sensor is provided, ideal to use with an IR Extender, like one provided by Xantech. The rear panel IR sensor also supports the IR remote control provided with the KD-MSW4x2 unit.

Mount the IR extender on the rear panel of the KD-MSW4x2 unit, or connect the wired serial connector cable to the wired IR connector jack on the rear panel.

Wired IR

A rear-panel wired IR serial connector is provided for use with an IR Extender, like one provided by Xantech. Connect the wired IR Extender to the 3.5 mm jack on the rear panel of the KD-MSW4x2 unit.

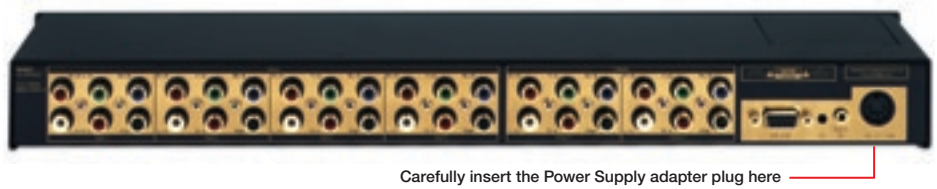
Applying Power

CAUTION: No other power supply adapter can be used with the KD-MSW4x2 unit. Use only the Power Supply provided in the carton! Using a power supply other than the one provided by Key Digital" with the unit VOIDS THE WARRANTY, may cause damage to the unit and associated equipment, and is a potential safety hazard.

Now that the A/V input and output interfaces are completed, it is recommended to double check all cables and connections before applying power.

Always test all connections and final operation first, before sealing cables behind walls or completing difficult wire routings.

To test connections before routing or hiding any wires behind walls or ceilings, use a reliable source (like a DVD player) and display that is known to be functioning properly.



Carefully insert the Power Supply adapter plug here

Once all the connections have been verified, plug the connector of the Power Supply into the power supply input jack on the rear panel of the KD-MSW4x2 unit.

Next, plug the external Power Supply provided with the unit into an appropriate wall outlet or source of AC power. The external power supply is rated: + 6V DC @ 5 Amps, 110-240 VAC, 50-60 Hz. For added safety and protection it is recommended to use a good quality surge protector.

The KD-MSW4x2 unit has no physical On/Off switch, except on the provided IR remote control.

Operation

Matrix Switching

With all of the video and audio sources connected to the four Input Ports, and the displays and audio systems connected to the two Output Ports of the KD-MSW4x2 unit, the matrix switcher is ready to operate. The routing of video and audio signals from the available inputs to either output is easily implemented using the front panel pushbuttons, and visually verifiable via the LED indicator arrays.

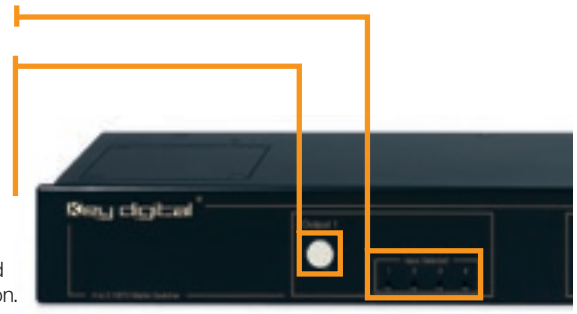
The front panel of the unit provides the user with a visual representation of the two outputs. Each of the two output sections consists of a large pushbutton switch and an array of four LED indicators. Each of these appropriately numbered LED indicators corresponds to one of the four available inputs.

For either display that is connected to the output of the KD-MSW4x2 unit, the desired source input is switched by depressing the appropriate pushbutton until the LED indicator corresponding to the chosen input is lit. The video and audio sources connected to that input are automatically switched to the selected output. The unit also acts as a distribution amplifier, simultaneously routing a single input to both outputs, by simply repeating the same procedure for both outputs.

Input 1, 2, 3, and 4 LED indicators

Use this front-panel pushbutton to select any of the up to four source input devices to drive the display and audio system wired to Output 1. Press the button and cycle through Input 1, 2, 3, and 4.

Repeat for Output 2 using the appropriate Output 2 pushbutton and LEDs for monitoring the input selection.



Summary: Control and Monitoring

- Select one of four input sources for each of the two outputs
  - Front-panel LEDs indicate the selected input, for each output
- Control via:
  - Front panel pushbuttons
  - IR remote control
    - Control all the features of the unit using the remote control
    - Power the KD-MSW4x2 On and Off
    - Requires a clear line-of-site between the IR remote control unit and the front-panel IR sensor
  - IR Extender
  - Wired IR
  - All control systems (with RS-232)

Fat Boy Expansion Control

Fat Boy expansions have multiple KD-MSW4x2 units pre-wired from the factory. Each unit in the expansion is individually addressable.

Configuring a particular unit with the desired input and output combination requires the following successive steps:

1. **Addressing desired Unit:**
   Depress button 1 through 8 to select the desired unit
2. **Addressing desired Output:**
   Depress button 'output 1' (to select Output 1), or 'output 2' (to select Output 2)
3. **Addressing desired Input:**
   Depress numerical digits 1 to 4

Additional Product Features

- **Fade-to-Black**
  The Fade-to-Black feature allows for switching between input/output combinations without the usual visual signal noise, glitches, and sync roll that traditionally accompany switching between video signals. The feature momentarily forces the video image to black as the desired source input is selected for the chosen output. This feature is applied automatically and the fade time interval is programmable via RS-232 [see the RS-232 Command List].

- **Video Mute**
  Video Mute enables the user to mute the video signal (the display goes to black) at the chosen output. Activated via IR remote control or RS-232 [see the IR remote control section of this manual, and the RS-232 Command List for explicit instructions].

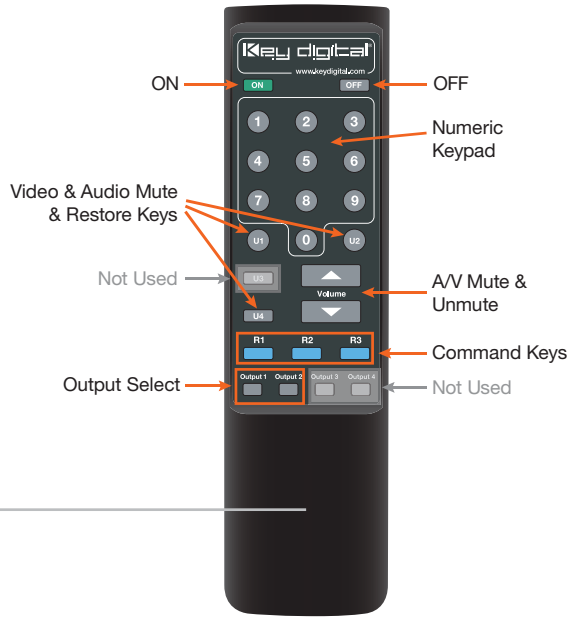
- **Distribution Amplifier**
  It is also possible under RS-232 control to allow any one of the four inputs to be switched and distributed to both outputs.

- **Power On/Off**
  Turn the KD-MSW4x2 On and Off. In the power-off mode, all front LEDs are Off and the video outputs are muted.

IR Remote Control

All the functions of the KD-MSW4x2 can be remotely accessed using the IR remote control supplied with the unit. The status-monitoring LEDs on the KD-MSW4x2 front panel will light to indicate the selections invoked by the IR remote control, just like when using the front-panel pushbutton switches.

The KD-MSW4x2 4-to-2 HDTV Matrix Switcher can be operated remotely using the supplied infrared (IR) remote control.



Remote Control Pushbuttons

- Carefully install the batteries in the handheld remote control unit. Periodically replace batteries in the handheld unit, as the operational distance of the remote control is affected by a weakened power source.

- The IR remote control unit is based on Infrared technology, requiring a clear line-of-site from the handheld control to the IR sensor located on the front panel of the KD-MSW4x2 unit.

- The IR Extender sensor located on the rear panel can also be used to receive the IR remote control signal, if an IR Extender is not connected or in use.
- Always point the front of the remote control directly at the IR sensor located on the KD-MSW4x2.
- The IR remote control may not operate properly if there are objects placed between it and the IR sensors located on the KD-MSW4x2 front panel.

Power "On" the Unit

To operate the KD-MSW4x2, be sure the unit is "On" (using the power supply provided with the unit). The IR remote control has separate "On" and "Off" pushbuttons. In the power-off mode, all front LEDs are Off and the video outputs are muted.

Matrix Switching with the IR Remote

The handheld IR remote control provides the same control functions as with the on-board pushbutton switches. Follow the instructions below and simply select Input 1, 2, 3, or 4 for Output 1 and Output 2.

NOTE: Be sure to select the video format

- Press 'R1' then '7' for RGBHV video
- Press 'R1' then '8' for YPbPr video

Press two digits on the IR remote control to perform the desired input and output switching function:

- First, enter the desired video/audio **output** (1 or 2). Simply press the button 'Output 1' or 'Output 2'.
- Then, use the Numeric Keypad to enter the desired source **input** (1-4).

For example, to connect a DVD player connected on input 3 to be viewed on the display connected to output 2, depress the keys 'Output 2' then '3' on the IR remote control, in that order.

Note that a blue LED channel input indicator on the front panel of the KD-MSW4x2 will blink for the selected output. Once the desired A/V input has been selected, this indicator blinks for three (3) seconds to confirm the selection.

1. FIRST SELECT OUTPUT 1 OR 2
2. THEN DIRECT INPUT 1, 2, 3, OR 4 TO THAT SELECTED OUTPUT

2.

Then press 1, 2, 3, or 4 to direct the respective source input device to that output

1.

First press either the "Output 1" button to select output 1, or the "Output 2" button to select output 2

Video and Audio Mute

Video Mute enables the user to mute the video signal (the display goes to black) at the chosen output. Activated via IR remote control [or RS-232, see the RS-232 Command List].

Activate Video & Audio Mute: R1 → output (1~2) → up arrow

Deactivate Video & Audio Mute: R1 → output (1~2) → down arrow

KD-MSW4x2 IR Remote Control Function Table

In addition to some of the functions described above, a complete list of all of the functions and corresponding button sequences that can be executed from the IR remote control provided with the KD-MSW4x2 are listed below:

Button Sequence			Function
"Output 1"	"1"		Output 1 = Input 1
"Output 1"	"2"		Output 1 = Input 2
"Output 1"	"3"		Output 1 = Input 3
"Output 1"	"4"		Output 1 = Input 4
"Output 2"	"1"		Output 2 = Input 1
"Output 2"	"2"		Output 2 = Input 2
"Output 2"	"3"		Output 2 = Input 3
"Output 2"	"4"		Output 2 = Input 4
"Output 1"	"U1"		Output 1 Audio Mute
"Output 1"	"U2"		Output 1 Audio Restore (unmute)
"Output 2"	"U1"		Output 2 Audio Mute
"Output 2"	"U2"		Output 2 Audio Restore (unmute)
"R1"	"Output 1"	"Up"	Output 1 Video and Audio Mute
"R1"	"Output 1"	"Down"	Output 1 Video and Audio Restore (unmute)
"R1"	"Output 2"	"Up"	Output 2 Video and Audio Mute
"R1"	"Output 2"	"Down"	Output 2 Video and Audio Restore (unmute)
"R1"	"U4"	"Up"	All Outputs Video and Audio Mute
"R1"	"U4"	"Down"	All Outputs Video and Audio Restore (unmute)
"R1"	"7"		All video outputs set to RGBHV
"R1"	"8"		All video outputs set to YPrPb
"R1"	"9"		Front buttons disabled
"R1"	"0"		Front buttons enabled

RS-232 Commands and Protocol

The KD-MSW4x2 4-to-2 HDTV Matrix Switcher can also be remotely controlled via its RS-232 port by systems such as Crestron, AMX, ELAN, and Control4, utilizing industry standard commands PROTOCOL:

- 4800 Baud rate
- 8 data bits
- 1 Stop bit
- No parity

RS-232 Cable

Carefully insert an RS-232 cable (9-pin) to the back of the unit, and to an appropriate PC or Control System.

An RS-232 cable is not supplied with the KD-MSW4x2 unit.

The RS-232 Command List for the KD-MSW4x2 HDTV Switcher is as follows:

1. **I/O switching command:**
   CCxy
   x = output position (1...2), y = input position (1..4)
2. **Status command:**
   CCww

   Note: Since both commands are of a defined length, no terminator is required

   Both commands give the following response:
   a) UUy1y2y
   b) Y1y2y3y4 – input states (1..4)
3. **Address command:**

   CCA<number (1~9)>
   CCA9 : Selects default KD-MSW4x2 unit (non addressable)
   CCA1~8 : Selects the KD-MSW4x2 unit corresponding to that predetermined numerical address

   Example:
   CCA5 sets the address to "5"
   The user must then press "5" to select/change a different source input on that unit
   IR 5→'output 1' →3 links output 1 to input 3

4. **Video Mute command:**
   IR : R1→ output 1-2 → Up arrow : Enable Mute
   R1 → output 1-2 → Down arrow : Disable Mute
   Example:
   R1→ output 1 → Up arrow : output 1 is muted

   Note: R1→ U4 → Up arrow mutes every output
   RS-232: CCm<number(1~3)> : Enable mute
   CCn<number(1~3)> : Disable mute

5. **Fade to Black interval set up command:**
   Period that will be muted is twice the interval
   CCi<number(0~9)>
   CCI0 : No mute
   CCI1 : 28 ms mute
   CCI2 : 40 ms mute
   CCI3 : 80 ms mute
   CCI4 : 120 ms mute
   CCI5 : 160 ms mute
   CCI6 : 240 ms mute
   CCI7 : 320 ms mute
   CCI8 : 400 ms mute
   CCI9 : 600 ms mute
6. **Power On/Off**
   s : Power OFF the KD-MSW4x2 unit
   q : Power ON the KD-MSW4x2 unit
7. **Output set up command:**
   IR: R1 → 7 : RGBHV mode
   R1 → 8 : Component mode
   RS-232 : CCOR : RGBHV mode
   CCOC : Component mode (factory default)
8. **Factory default command:**
   CCF0 : Resets memory
   Inputs for every output = 1
   Mute Interval = 240 ms
9. **IR Remote Control commands:**
   I :Disable IR Remote Control
   u :Enable IR Remote Control
10. **Front Panel Pushbutton commands:**
    d : Disable front panel pushbutton controls
    e : Enable front panel pushbutton controls
11. **Switching any input to both outputs commands (Distribution Amplifier mode):**
    z<number(1~4)> : Switches both outputs to any one input temporarily; can be restored to original selection
    z0 : Restores the original input-output configuration
    Example:
    z3 : Switches both outputs to input 3

TECHNICAL SPECIFICATIONS

Model #: KD-MSW4x2

4 Inputs to 2 Outputs HDTV Matrix Switcher

The Fat Boy Series KD-MSW4x2 by Key Digital™, is an analog HDTV 4-Input to 2-Output matrix switcher and distribution amplifier.

Matrix Switching

- Supports Video and Audio
- Four (4) Input Ports and two (2) Output Ports provided
- Matrix switch one of up to four inputs to either of two outputs
  - For each of the two outputs that can be used to drive separate displays, one of the four source inputs can be independently selected
- Also acts as a distribution amplifier, simultaneously routing any individual input to both outputs
  - Using RS-232 control
- Expandable

Professional Switching Features

- **Fade-to-Black:** allows for switching between input/output combinations without the usual visual signal noise, glitches, and sync roll that traditionally accompany switching between video signals
  - The feature momentarily forces the video image to black as the desired source input is selected for the chosen output
  - This feature is applied automatically
  - Fade time interval is programmable via the RS-232, and is equivalent to a “Video Mute” to force the video to black during switching
    - See the RS-232 Command List
- **Video Mute:** enables the user to mute the video signal (the display goes to black) at the chosen output

Input/Output Ports and Formats

- The output format = the format of the selected input source
- Each Input and Output Port is comprised of six (6) color-coded RCA jacks:
  - 3 analog video connectors
  - 2 analog audio connectors
    - The analog audio input/output connectors also serve as the horizontal and vertical sync for RGBHV signals
- 1 PCM digital coax audio connector

- Each Port supports:
  - YPbPr component video, analog stereo left and right audio, and digital PCM audio
  - RGBHV video and digital PCM audio
  - RGB video with sync on the green channel, analog stereo left and right audio, and digital PCM audio
  - S-Video and composite video (CVBS), with adapters
- Each connector can accommodate various signals, on a shared basis:
  - Red Connector: Pr/R
    - Pr label is for component video
    - R label is for the red channel for RGBHV video
  - Green Connector: Y/G
    - Y label is for component video
    - G label is for the green channel for RGBHV video
  - Blue Connector: Pb/B
    - Pb label is for component video
    - B label is for the blue channel for RGBHV video
  - White Connector: L/H
    - L label is for the left analog stereo audio channel
    - H label is for the horizontal sync for RGBHV video
  - Red Connector: R/V (Right analog stereo audio, or vertical sync for RGBHV video)
    - R label is for the right analog stereo audio channel
    - V label is for the vertical sync for RGBHV video
  - Black Connector: PCM
    - For PCM digital coax audio

Resolution

- The output resolution = the resolution of the selected input source
- Handles all HD and SD resolutions (50 and 60 Hz) including 1080p/60
- Supports analog video bandwidths up to 300 MHz
- Performs no video or audio processing:
  - Introduces no degradation in video or audio signal quality

Compatible Video Signals

- Compatible with all standard analog video signal formats that use 50 Hz or 60 Hz refresh rates, including:
  - 1080p, 1080i, 720p, 576p, 576i, 540p, 480p, 480i

Video Characteristics

- Output stage drives high-quality, equal-length video cables up to 300' or more
- 1V p-p @ 75 ohms, terminated
- Composite video sync on "Y" input (YPbPr)
- Video bandwidth:
  - -3 dB @ 300 MHz
  - Linear phase pass-band
- Unity video gain
- Input terminations: for proper operation of the high quality electrical circuits in the KD-MSW4x2 unit, do NOT "daisy chain" inputs:
  - Each input of the KD-MSW4x2 has its own 75 ohm termination
  - Do NOT feed a source to multiple KD-MSW4x2 inputs without proper distribution equipment

Analog Audio Characteristics

- Left and Right stereo on two color-coded RCA connectors
- High-impedance (1K ohm) line level inputs
- Analog Audio Muting provided
- Analog Audio is not supported for RGBHV video applications:
  - Connectors are used for H&V

Digital Audio Characteristics

- Standard digital PCM coax format on one color-coded RCA connector

Control and Monitoring

- Select one of four input sources for each of the two outputs
  - Front-panel LEDs indicate the selected input, for each output
- Control via:
  - Front panel pushbuttons
  - IR remote control, with extensive commands and control
  - IR Extender
  - Wired IR
  - All control systems (with RS-232, cable not supplied)

Connectors

- Each Input and Output Port is comprised of six (6) color-coded RCA jacks
- RS-232C: D-sub 9-pin
- 5-pin power connector for external AC-DC power supply input
- 3.5 mm jack for serial, wired IR input

Mechanical

- Size: 16" (L) x 4" (W) x 1.7" (H)
- Weight: 5 lbs.
- Enclosure Type: Metal
- Rack Mount Size: 1 U

Power Requirements

- External power supply provided
- + 6V DC @ 5 Amps, 110-240 VAC, 50-60 Hz

CAUTION: No other power supply adapter can be used with the KD-MSW4x2 unit. Use only the Power Supply provided in the carton! Using a power supply other than the one provided by Key Digital™ with the unit VOIDS THE WARRANTY, may cause damage to the unit and associated equipment, and is a potential safety hazard.

How to Contact Key Digital™

Repairs and Warranty Service

- Should your KD-MSW4x2 4-to-2 HDTV Matrix Switcher require warranty service, please contact Key Digital™ to obtain a Returned Materials Authorization (RMA) number
- Please contact us at either:
  - Phone: **1-914-667-9700 ext 215**
  - E-mail: **rma@keydigital.com**

Technical Support

- For technical questions about using our products, please contact us at either:
  - Phone: **1-914-667-9700 ext 301**
  - E-mail: **tech@keydigital.com**

Customer Support

- For customer support questions about using our products, please contact us at either:
  - Phone: **1-914-667-9700 ext 223**
  - E-mail: **customersupport@keydigital.com**

Warranty

All Key Digital™ products are built to high manufacturing standards and should provide years of trouble-free operation. They are backed by a limited two-year parts and labor warranty.

Installation Notes

Installation Notes